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8.0.G Message end of class Day 8

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Chem 444A Fire & Ice, Assignment for Tues Feb 17

This assignment gets you to review and think about the entire class's data from Thursday, along with the PhET simulation of gas/liquid/solid that you reviewed prior to that class.

The experimental data you acquired on Thursday are called heating or cooling curves. It is a record of the temperature of a substance as it has heat provided to it or removed from it.

On BB are posted each individual graph of data, and in a separate file, a graph of mine of the cooling of water. You should definitely look at this new one. Bring notes about the following questions.

1) Look at the experimental procedures again for each experiment A -G, and then look at the graph from that group. Also look at the experiment that I did with cooling of water.

2) The data consist of two observations, the first being the state of the material being heated or cooled when at its highest and lowest temperatures. For your own experiment what was the state at the start, at the temperature extreme, and when it came back to room temperature when place in the room temperature water bath? Some other groups note observation about this on their graphs. Are they consistent with your observations?

3) The second observation is the shape of the heating/cooling curve. The shape you see is affected by some real phenomenon that could be happening, and by imperfections in the experimental approach. Normally, to get really accurate results for this experiment, it is desired to have uniform heating/cooling throughout the substance being tested. The heating and cooling should be done very slowly (we went quickly) and with a smaller quantity of material than what we used. So, the first thing to do is determine what features of the shape indicate a real phenomenon and what features are artifacts of the imperfections. BEFORE you consider this….

4) ….. think back to the PhET simulation that looked at a substance in its solid, liquid, and gaseous forms, and how it allowed you to control the form by adding or removing heat. Sound familiar? (You may want to revisit the PhET to answer these questions.)

   a) In the solid phase, how are the molecules positioned and what are they doing? If you STAY in the solid phase, what effect does adding or removing heat have on the molecules?

   b) In the liquid phase, how are the molecules positioned and what are they doing? If you STAY in liquid phase, what effect does adding or removing heat have on the molecules?

   c) At the transition point in going from solid to liquid, what changes in the behavior of the molecules? What causes that change in behavior?

      Go through the same three-step thought process for considering liquid vs gas phase.

5) Now, reconsider the heating/cooling curves. What features of the curves match up with your thoughts concerning a,b,c in #4?

On Tuesday, we'll organize so you can discuss these questions to build an integrative model for how heat it related to the phase of a substance.

Christopher F. Bauer, Principal Investigator.
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